

Approach to the Patient with Affection and Disease of the Blood

LECTURE IN INTERNAL MEDICINE PROPAEDEUTICS

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Plan of the lecture



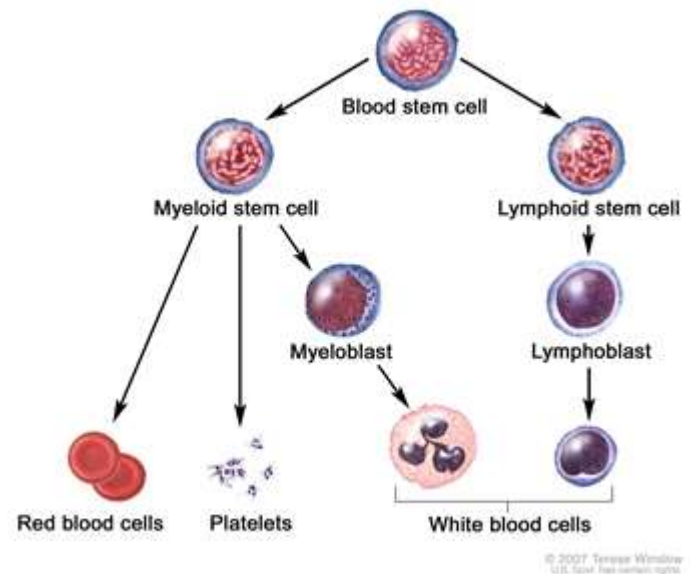
Approach to the Patient with Affection and Disease of the Blood

- Blood disorders definition
- Interviewing of the patient
- Physical examination of the patient
- Instrumental methods
- laboratory methods

Blood disorders definition

Blood disorders can affect any of the three main components of blood

- Red blood cells, which carry oxygen to the body's tissues
- White blood cells, which fight infections
- Platelets, which help blood to clot
- Blood disorders can also affect the liquid portion of blood (plasma)
- Treatments and prognosis for blood diseases vary, depending on the blood condition and its severity



Interviewing of the patient: four overlapping processes

1. *engaging* (connecting with patients and establishing a good working relationship)
2. *focusing* (agreeing on the target of motivational enhancement and directing the conversation toward it)
3. *evoking* (drawing out the patients' own motivations for changing the target behavior)
4. *planning* (developing commitment to change and formulating a specific plan of action)



Interviewing of the patient: Good questions to get started on the core interview



Communication skills:

- Active listening
- Empathy
- Building rapport
- Open-ended questions
- Leading questions
- Silence
- “Why” questions
- Nonverbal communication cues

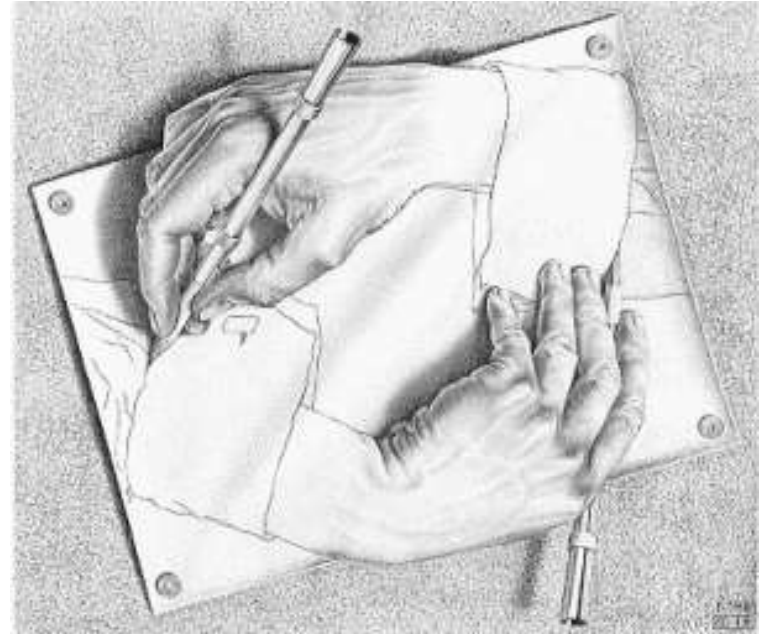
Interviewing of the patient: Good questions to get started on the core interview

- What is your chief complaint?
- Tell me why you're here today
- Tell me about your injury
- What can I do to help you?
- Explain to me your understanding of your injury

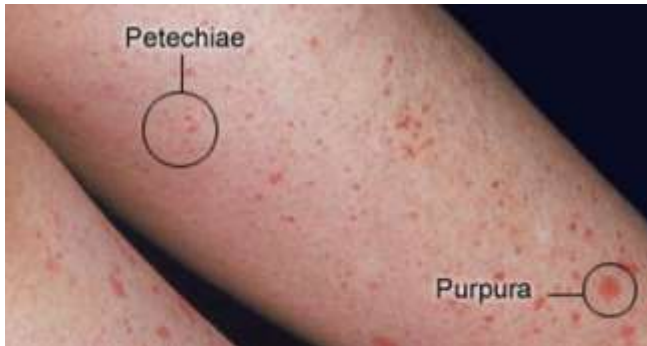


Interviewing of the patient: Patient profile

- Age
- Sex
- Race/Ethnicity (for example, sickle cell disease occurs mainly in blacks)
- Handedness
- Ht-Wt-BMI-Body type
- Primary language
- Barriers to learning
- Learning preference
- Unique rehabilitation goals



Interviewing of the patient: complaints



- Fatigue
- Weakness
- Shortness of breath
- Recurrent fever and infections
- Abnormal bleeding and bruising
- Petechiae
- Redness
- Purpura
- Blood blisters
- Bone pain



- Pallor
- Red complexion (plethora)
- Thrombosis (inappropriate excessive blood clotting)
- Swelling
- Warmth of the legs
- Swollen lymph nodes
- Pica
- Abdomen enlargement because of liver and spleen enlargement

Interviewing of the patient: complaints (fatigue)

- Fatigue (exhaustion, tiredness, languidness, languor, lassitude, listlessness) is a subjective feeling of tiredness which is distinct from weakness, and has a gradual onset
- Chronic blood loss frequently results in chronic fatigue lasting at least six consecutive months and may be either persistent or relapsing
- Some major categories of blood diseases that feature fatigue include such as anemia, hemochromatosis, leukemia (lymphoma)

Sings and symptoms



Interviewing of the patient: complaints (weakness)

- Weakness is the feeling of body fatigue (tiredness)
- A person experiencing weakness may not be able to move that part of their body properly or they may experience tremors (uncontrollable movement or twitches) in the area of weakness



Interviewing of the patient: complaints (shortness of breath)

- Shortness of breath, dyspnea, dyspnoea, or breathlessness is the feeling or feelings associated with impaired breathing
- Anaemia caused by low hemoglobin levels is often a cause of shortness of breath



Interviewing of the patient: complaints (recurrent fever and infections)

- This syndrome includes recurrent episodes of fever with stomatitis and pharyngitis
- Fever can occur during the day or night, although drenching night sweats are often a manifestation of malignancy and, if persistent, should prompt the clinician to consider neoplastic disease, i.e. blood cancers, like leukemia and lymphoma
- Physicians should counsel their patients with suspected persistent fever to keep a temperature diary, taking their temperature at periods throughout the day and night in order to assess any underlying pyrexial pattern



Interviewing of the patient: complaints (abnormal bleeding and bruising)

- Spontaneous bleeding may occur in almost any part of the body, but it is most common in the nose and mouth and the digestive tract
- People with hemophilia often bleed into their joints or muscles
- Several symptoms may suggest that a person has a bleeding disorder:
 - Unexplained nosebleeds (epistaxis)
 - Excessive or prolonged menstrual blood flow (menorrhagia)
 - Prolonged bleeding after minor cuts, blood drawing, minor surgical or dental procedures, or tooth brushing or flossing
 - Unexplained skin marks, including tiny red or purple dots (petechiae), red or purple patches (purpura), bruises (ecchymoses), or small blood vessels that are widened and therefore visible in the skin or mucous membranes (telangiectasias)
 - Sometimes a laboratory test done for some other reason shows the person has a susceptibility to bleeding

Interviewing of the patient: complaints (abnormal bleeding and bruising)



Purpura bruising



Hemophilia

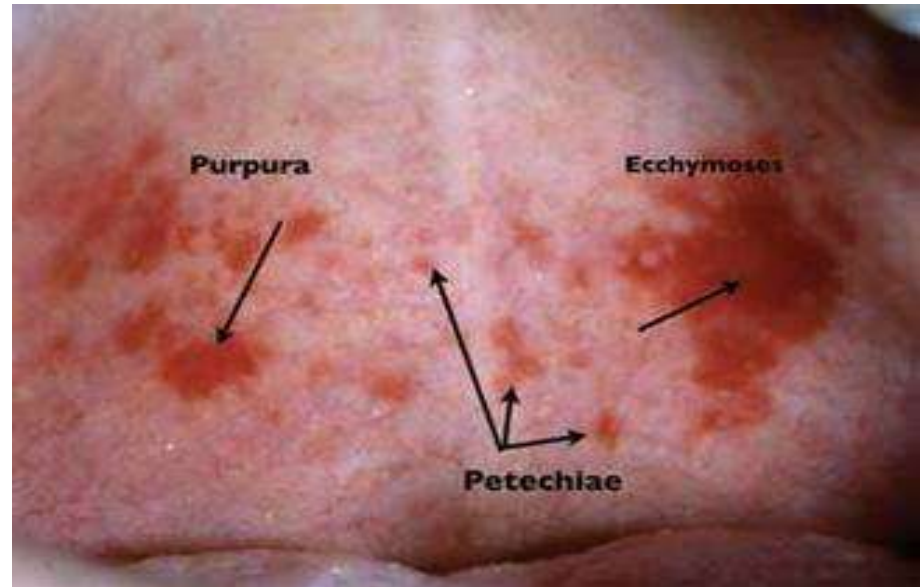


**Anticoagulants warfarin:
side effects**

- An abnormality in the factors can lead to excessive bleeding or bruising:
- Platelet disorders, including too few platelets (thrombocytopenia), too many platelets, and defective platelet function
- Decreased activity of blood clotting factors (for example, due to hemophilia, liver disorders, or vitamin K deficiency or to the use of certain drugs)
- Defects in blood vessels (for example, due to damage)

Interviewing of the patient: complaints (petechiae)

- A petechiae are a small (1–2 mm) red or purple spots on the skin, caused by a minor bleed (from broken capillary blood vessels)
- Petechiae refers to one of the three descriptive types of bleeding into the skin differentiated by size, the other two being purpura and ecchymosis
- Some major categories of blood diseases that feature petechiae include such as thrombocytopenia, clotting factor deficiencies, leukemia



Interviewing of the patient: complaints (purpura)

- Purpura are red or purple discolorations on the skin that do not blanch on applying pressure
- Purpura measure 0.3–1 cm (3–10 mm), whereas petechiae measure less than 3 mm, and ecchymoses greater than 1 cm
- Some major categories of blood diseases that feature purpura include such as platelet disorders, and coagulation disorders (disseminated intravascular coagulation, scurvy (vitamin C deficiency))



Interviewing of the patient: complaints (redness)

- Redness of the skin or erythema, is caused by hyperemia of superficial capillaries
- Redness disappears on finger pressure (blanching), while purpura or bleeding in the skin and pigmentation do not
- There is no temperature elevation, unless it is associated with the dilation of arteries in the deeper layer of the skin



Interviewing of the patient: complaints (blood blisters)

- A blood blister is a type of blister that forms when subdermal tissues and blood vessels are damaged without piercing the skin
- It consists of a pool of lymph, blood and other body fluids trapped beneath the skin
- Some blood blisters can be extremely painful due to bruising where the blister occurred



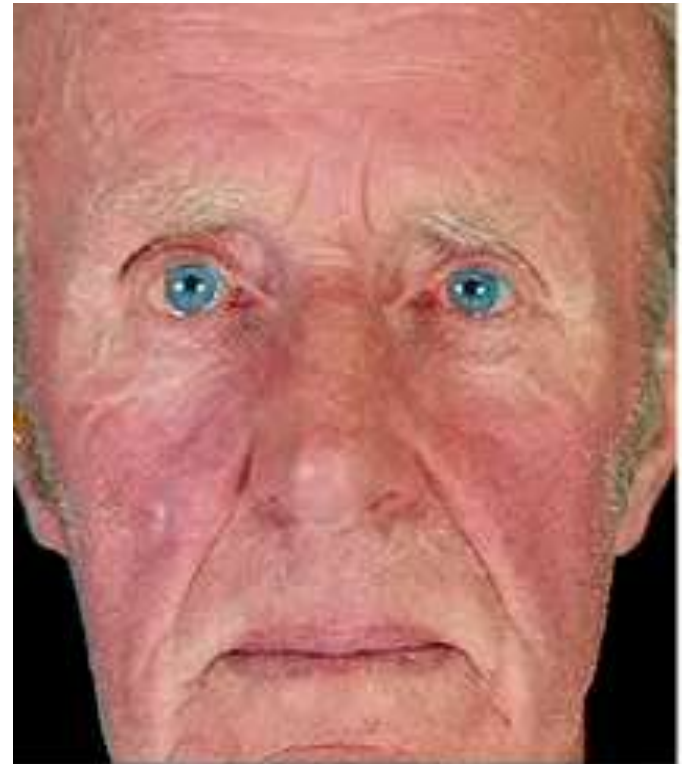
Interviewing of the patient: complaints (pallor)

- Pallor is a pale color of the skin that can be caused by illness, emotional shock or stress, stimulant use, or anemia, and is the result of a reduced amount of oxyhaemoglobin and is visible in skin or mucous membrane
- Pallor is more evident on the face and palms



Interviewing of the patient: complaints (red complexion (plethora))

- Patients with a high red blood cell mass (polycythemia vera) have plethora or a red complexion
- If the polycythemia is secondary to hypoxia, patients can also appear cyanotic
- Increased red blood cell mass increases blood viscosity and decreases tissue perfusion
- With impaired circulation to the central nervous system, patients may present with headaches, lethargy, and confusion or more serious presentations, such as stroke



Interviewing of the patient: complaints (thrombosis (inappropriate excessive blood clotting))

- Thrombosis is the formation of a blood clot inside a blood vessel, obstructing the flow of blood through the circulatory system
- A clot that breaks free and begins to travel around the body is known as an embolus
- The main causes of thrombosis are given in Virchow's triad which lists hypercoagulability, endothelial cell injury, and disturbed blood flow
- Hypercoagulability or thrombophilia, is caused by, for example, genetic deficiencies or autoimmune disorders



Interviewing of the patient: complaints (swelling)

- Swelling is an increase in the size or a change in the shape of an area of the body
- Swelling can be caused by collection of body fluid, tissue growth, or abnormal movement or position of tissue
- Swelling in blood diseases often is the result of an inappropriate excessive blood clotting



Interviewing of the patient: complaints (warmth of the leg)

- Deep venous thrombosis (DVT) refers to a blood clot embedded in one of the major deep veins of the lower legs, thighs, or pelvis
- A clot blocks blood circulation through these veins, which carry blood from the lower body back to the heart
- The blockage can cause acute pain, swelling, or warmth in the affected leg



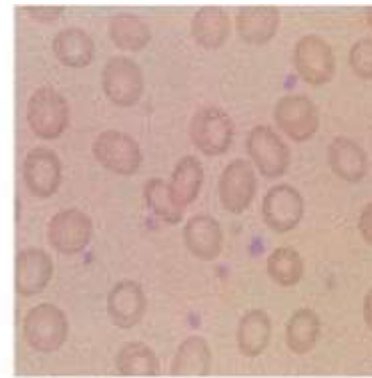
Interviewing of the patient: complaints (swollen lymph nodes)

- Lymph nodes in only one body area may be swollen, or nodes in two or more body areas can be swollen
- Probably less than 1% of people with swollen lymph nodes have cancer, including leukemia
- Swollen lymph nodes in leukemia patients typically are found in the throat, armpits, or groin

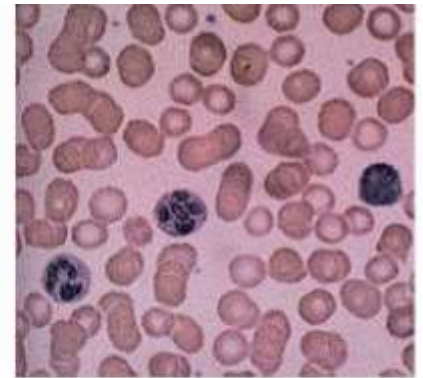


Interviewing of the patient: complaints (pica)

- Pica is characterized by an appetite for substances that are largely non-nutritive, such as paper, clay, metal, chalk, soil, glass, or sand
- The scant research that has been done on the causes of pica suggests that the disorder is a specific appetite caused by mineral deficiency in many cases, such as iron deficiency anemia

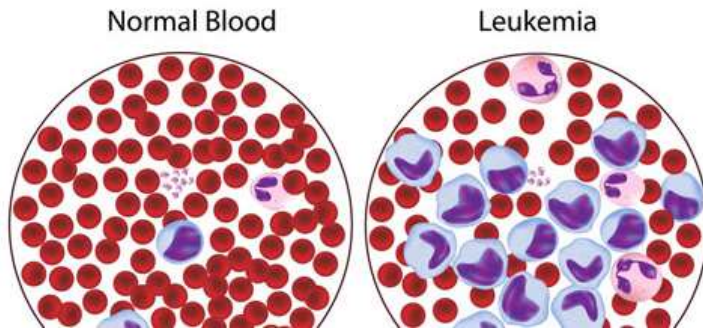


anemia

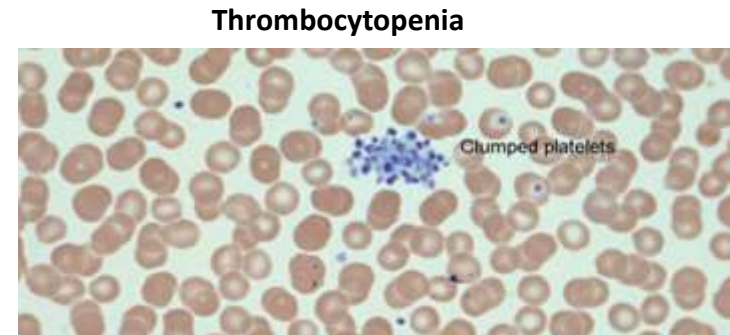


normal blood

Interviewing of the patient: symptoms in complaints



- Decreased red blood cells, hemoglobin, iron deficiency: fatigue, weakness, shortness of breath, pallor, pica
- Decreased white blood cells or immune system proteins: recurrent fever and infections
- Decreased platelets or blood clotting factors: abnormal bleeding, bruising, petechiae



- Increased red blood cells: headache and a red complexion (plethora)
- Increased white blood cells or immune system proteins: increased blood viscosity (thickening of the blood)
- Increased platelets or blood clotting factors: redness, thrombosis (inappropriate excessive blood clotting)

Interviewing of the patient: specific questions for set of complaints

Each of complaints will prompt a series of specific questions that will help arrive at a preliminary single diagnosis, or a group of different diagnoses



Interviewing of the patient: example of specific questions in complaint

- Character
- Location
- Severity
- Timing
- Duration
- Radiation
- Provocation
- Relieving conditions
- When did it first start?
- How often does it occur?
- Is it becoming more frequent with time?
- Were there associated symptoms
- Are the symptoms lasting longer?
- How the symptoms relate to food intake?

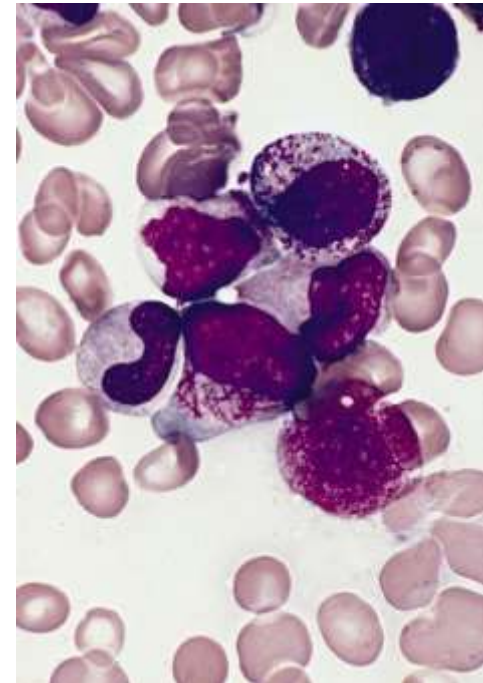
Interviewing of the patient: past medical history

In a medical encounter, a past medical history (abbreviated PMH), is the total sum of a patient's health status prior to the presenting problem

The image shows a close-up of a medical form. The section 'Past Medical History' is highlighted. It includes a 'Cardiac' subsection with radio button options: None, Unknown, Angina, Arrhythmia, Cardiomyopathy, CHF, Congenital, Implanted Defib, and Other. To the right, there are more radio button options: None, Unknown, Abdominal, Heart, Lung, and Neurological. Below the 'Past Medical History' section, the 'Chronic Illnesses' section is partially visible, with 'Hypertension/Renal' and 'Intestinal' listed. A black pen is resting diagonally across the form.

Interviewing of the patient: prior or current treatment

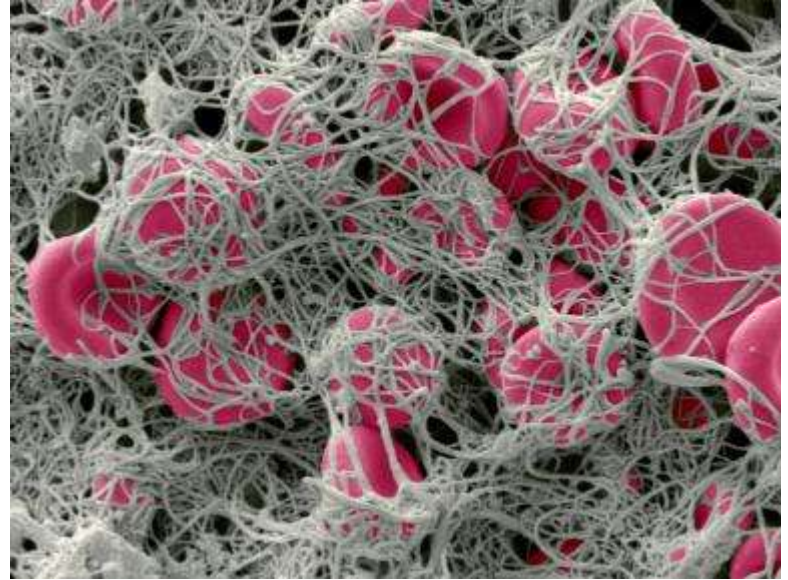
- Any constantly used drug that may cause bleeding (such as aspirin, nonsteroidal anti-inflammatory drugs, warfarin) or marrow suppression (methotrexate)
- Previous surgery
- Injections
- Chiropractic
- Exercise/PT (Physical Therapy)
- ER (Emergency Room)
- Massage therapy



[Leukemia](#)

Interviewing of the patient: any constantly used medications

- Drugs prescribed for diabetes mellitus, hypertension, cardiac disorders, hormonal disorders, cancer, arthritis, immunopathological processes, psychiatric disorders, etc.



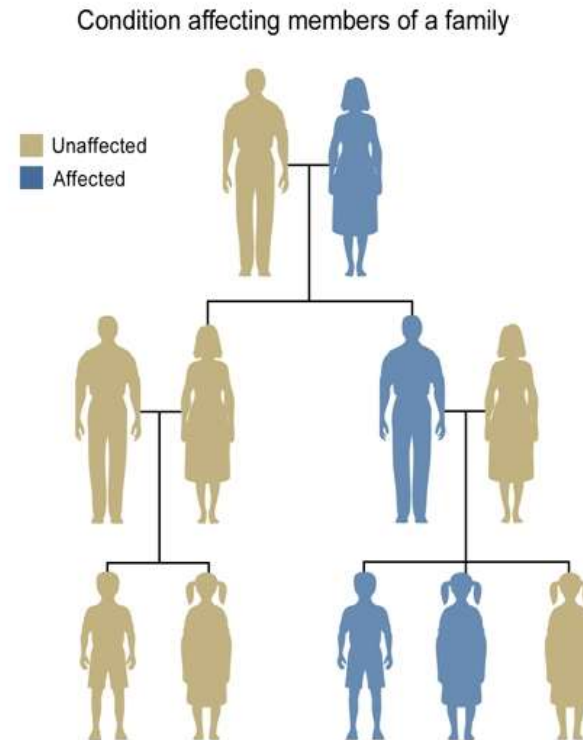
Interviewing of the patient: previous treatment and present status

- Previous Treatment
 - What?
 - Where?
 - When?
 - By whom?
- Present Status
 - Better vs. same vs. worse



Interviewing of the patient: family history and genetic risk

- A blood disorder in a member of the person's family
- The physician will inquire about the health of the patient's parents, brothers, sisters and children
- A family history of the diseases of the blood may be relevant to the underlying problem



Interviewing of the patient: social history

- High-risk behaviors
 - Alcohol, tobacco, or drug abuse
 - Depression
 - Violence
 - Sedentary lifestyle
 - Exposures to a chemical agents that could cause bleeding or damage the bone marrow
- Signs of any of the above behaviors may warrant referral to a secondary provider



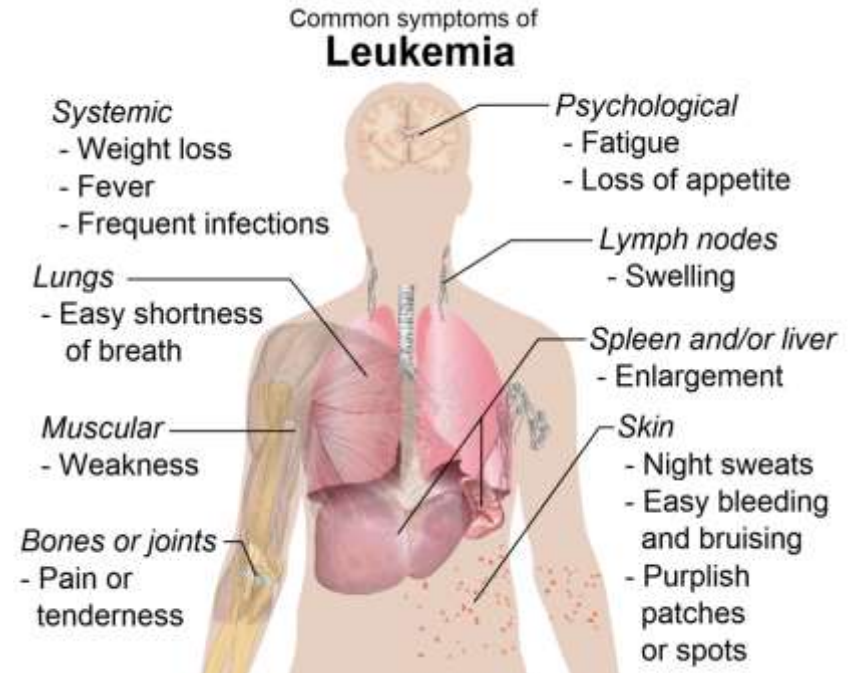
Interviewing of the patient: why take a medical history?

- Up to 90% of conditions can be accurately diagnosed or recognized by conducting a thorough medical history and listening carefully to the patient's response(s)
- Determines the necessary tests and measures you should prioritize for your objective examination



Interviewing of the patient: review of systems

- The "laundry list" of symptoms related to various organs of the body
- A series of questions helps seek out information that the patient may have neglected to provide the physician
- Review of systems helps to identify the patient's problem, or exclude different parts of the differential diagnosis



Interviewing of the patient: systemic enquiry

- General: fever, weight loss, loss of appetite, lethargy
- Respiratory and cardiovascular systems: shortness of breath, cough, hemoptysis, wheeze, chest pain
- Gastrointestinal system: nausea and vomiting, hematemesis, dysphagia, heartburn, jaundice, abdominal pain, change in bowel habit, rectal bleeding, tenesmus (sensation of incomplete bowel emptying)
- Genito-urinary system: dysuria (pain on passing urine), frequency, terminal dribbling, urethral discharge
- Gynecological system: pelvic pain, vaginal bleeding, vaginal discharge, LMP
- Neurological system: headaches, dizziness, loss of consciousness, fits, faints, funny turns, numbness, tingling, weakness, problems speaking, change in vision
- Musculoskeletal system and connective tissue: joint stiffness and swelling, muscle weakness, bone fractures, sensitivity to sunlight, malaise, cold and numb fingers or toes

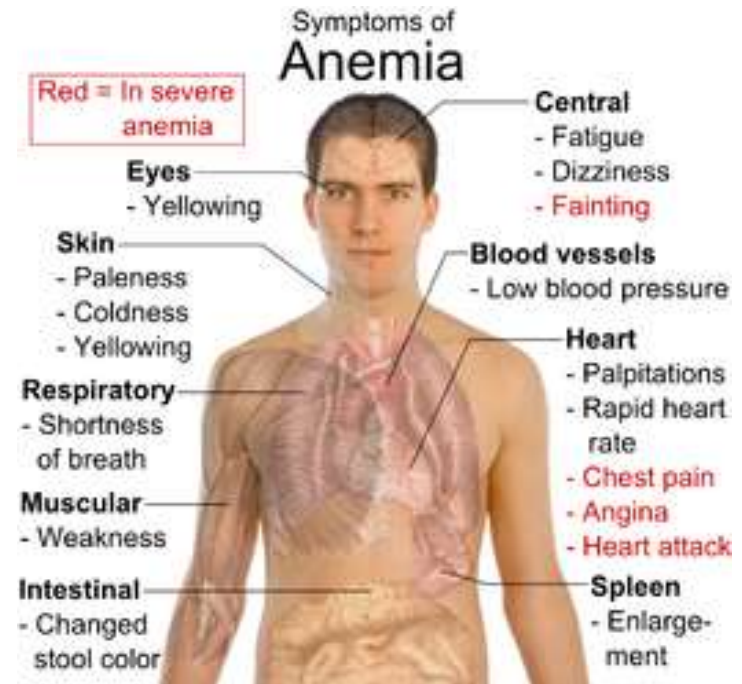
Interviewing of the patient: the Blood Diseases Quality of Life Indexes

Still expected !!!

Physical examination of the patient: the main points

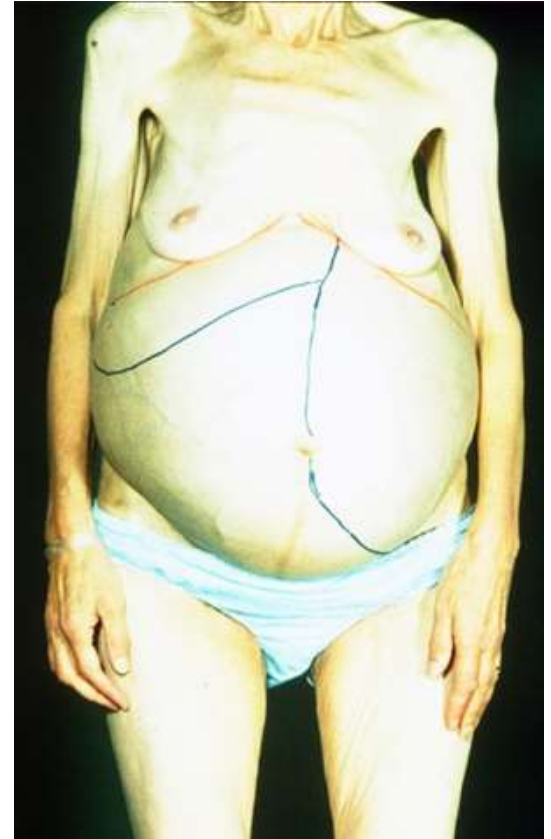
Look for specific findings that can be related to a blood disorder:

- Examine the skin and mucous membranes (such as the inner surface of the eyelids or the mouth), looking for paleness, abnormal blood vessels (telangiectasias), bruises, small red or purple spots, or red rashes
- Control the neck, underarm, and groin areas for enlargement of lymph nodes
- Examine the joints to see if they are tender or swollen
- Investigate the abdomen, feeling for enlargement of the spleen or liver
- Do a rectal examination to check the stool for blood



Physical examination of the patient: do not do it without looking at the patient

- Too often, the physician rushes into the physical examination without looking at the patient for an unusual habitus or appearance of underdevelopment, malnutrition, or chronic illness
- These findings can be important clues to the underlying etiology of disease and provide information related to the duration of illness
- The skin and mucous membranes are often bypassed, so that pallor, abnormal pigmentation, icterus, spider nevi, petechiae, purpura, angiomas, ulcerations, palmar erythema, coarseness of hair, puffiness of the face, thinning of the lateral aspects of the eyebrows, nail defects, and a usually prominent venous pattern on the abdominal wall are missed in the rush to examine the heart and the lungs



Myelofibrosis

Physical examination of the patient: helpful in planning additional studies

- Examine optic fundi carefully but not at the expense of the conjunctivae and the sclerae, which can show pallor, icterus, splinter hemorrhages, petechiae, comma signs in the conjunctival vessels, or telangiectasia that can be helpful in planning additional studies



Subconjunctival hemorrhage

Physical examination of the patient: unilateral edema may portend lymphatic obstruction due to a malignancy

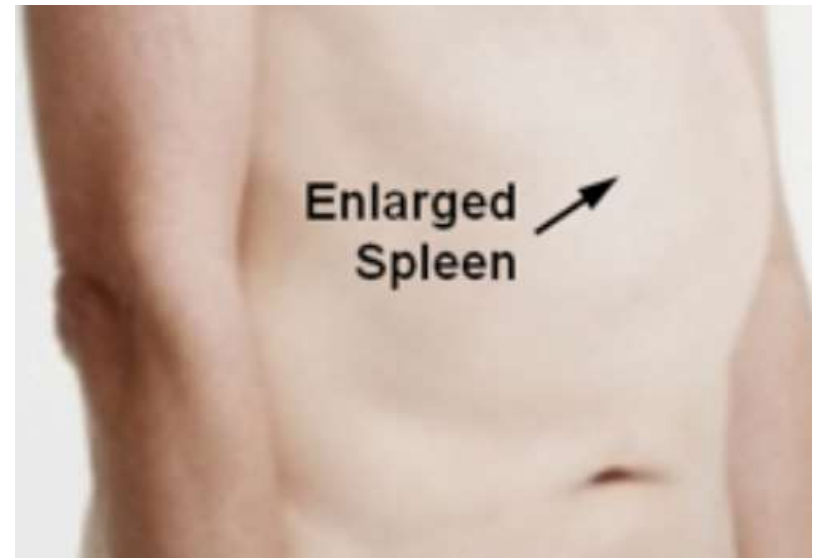
- Perform systematic examination for palpable enlargement of lymph nodes for evidence of infection or neoplasia
- Bilateral edema is useful in disclosing underlying cardiac, renal, or hepatic disease, whereas unilateral edema may portend lymphatic obstruction due to a malignancy that cannot be observed or palpated.



**Enlargement of one or more
lymph nodes under the arm**

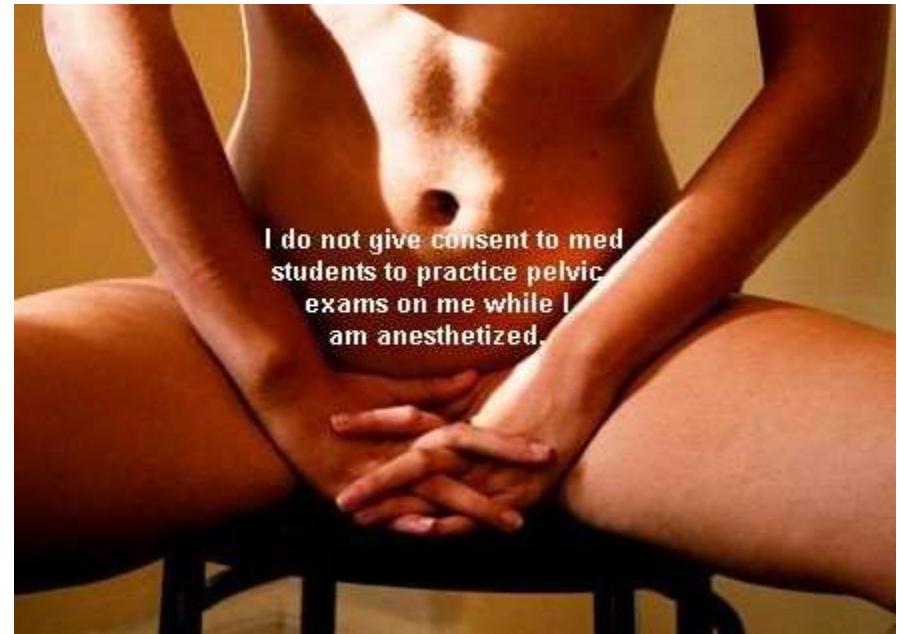
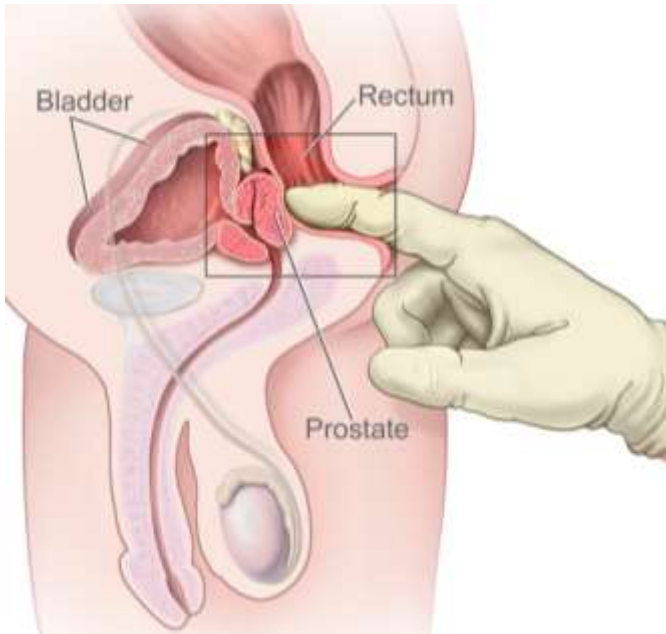
Physical examination of the patient: search for hepatomegaly and splenomegaly

- Carefully search for hepatomegaly and splenomegaly
- Their presence or absence is important, as are the size, the tenderness, the firmness, and the presence or the absence of nodules
- Splenomegaly is the most common physical finding in patients with leukemia
- Hepatomegaly also occurs, although less commonly than splenomegaly



Myelofibrosis

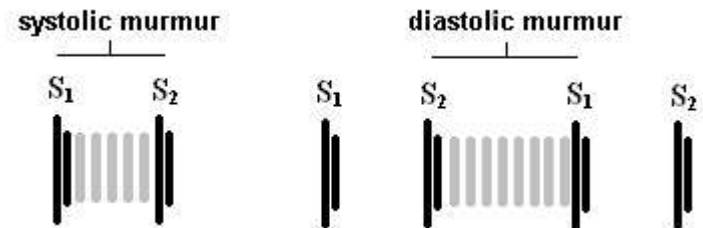
Physical examination of the patient: a rectal and pelvic examination cannot be neglected



A rectal and pelvic examination cannot be neglected, because tumor or infection of these organs can be the cause of anemia

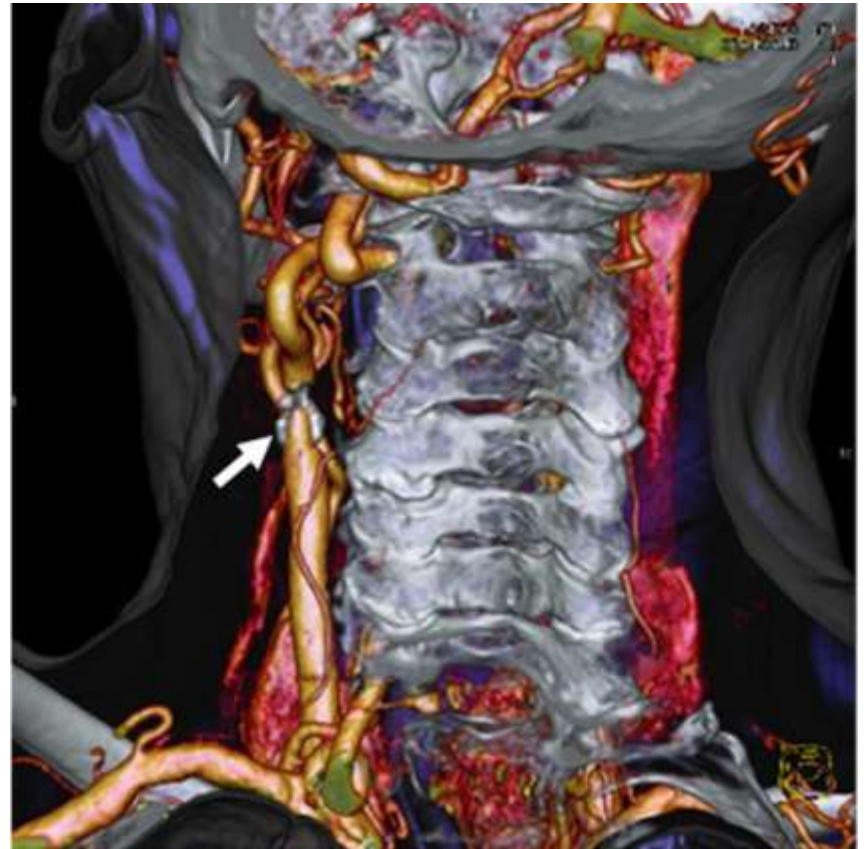
Physical examination of the patient: the heart and nerves should not be ignored

- The neurologic examination should include tests of position sense and vibratory sense, examination of the cranial nerves, and testing for tendon reflexes
- The heart should not be ignored, because enlargement may provide evidence of the duration and the severity of the anemia, and murmurs may be the first evidence of a bacterial endocarditis that could explain the etiology of the anemia



Instrumental methods: imaging studies

- Imaging studies include X-ray, magnetic resonance imaging (MRI), ultrasound, and computed^d tomography (CT)
- X-ray ordinary is used in investigation of blood diseases on such body parts as bones
- MRI is used in the brain investigation
- Ultrasound is used in the kidneys, spleen, and liver investigation
- Computed^d tomography is used to check lymph nodes in the chest



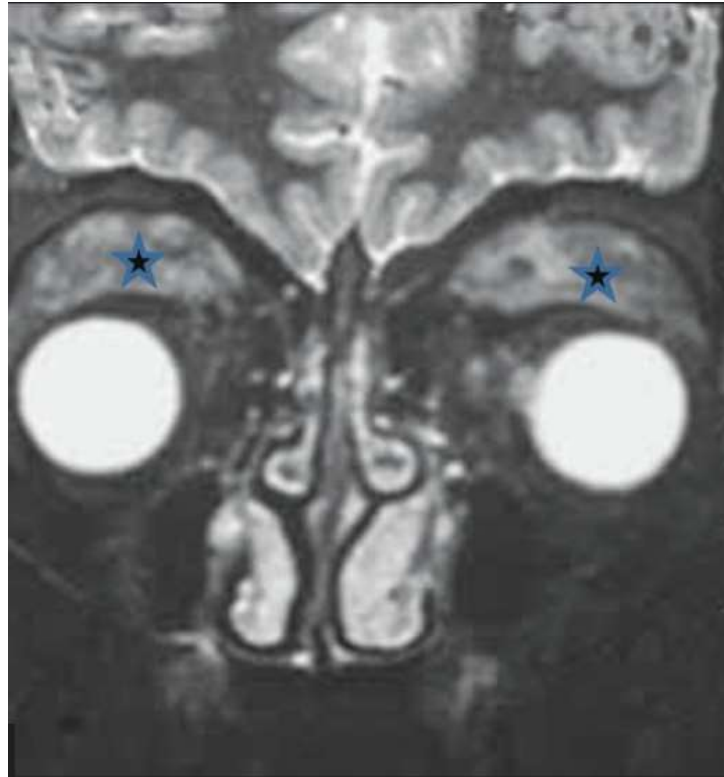
Computed Tomography

Instrumental methods: X-ray

- Chest x-ray from a patient with hairy cell leukemia shows a diffuse interstitial infiltrate
- In these patients, this appearance is often due to infection
- Here, however, the patient was found to have metastatic squamous cell carcinoma on bronchoscopy



Instrumental methods: magnetic resonance imaging



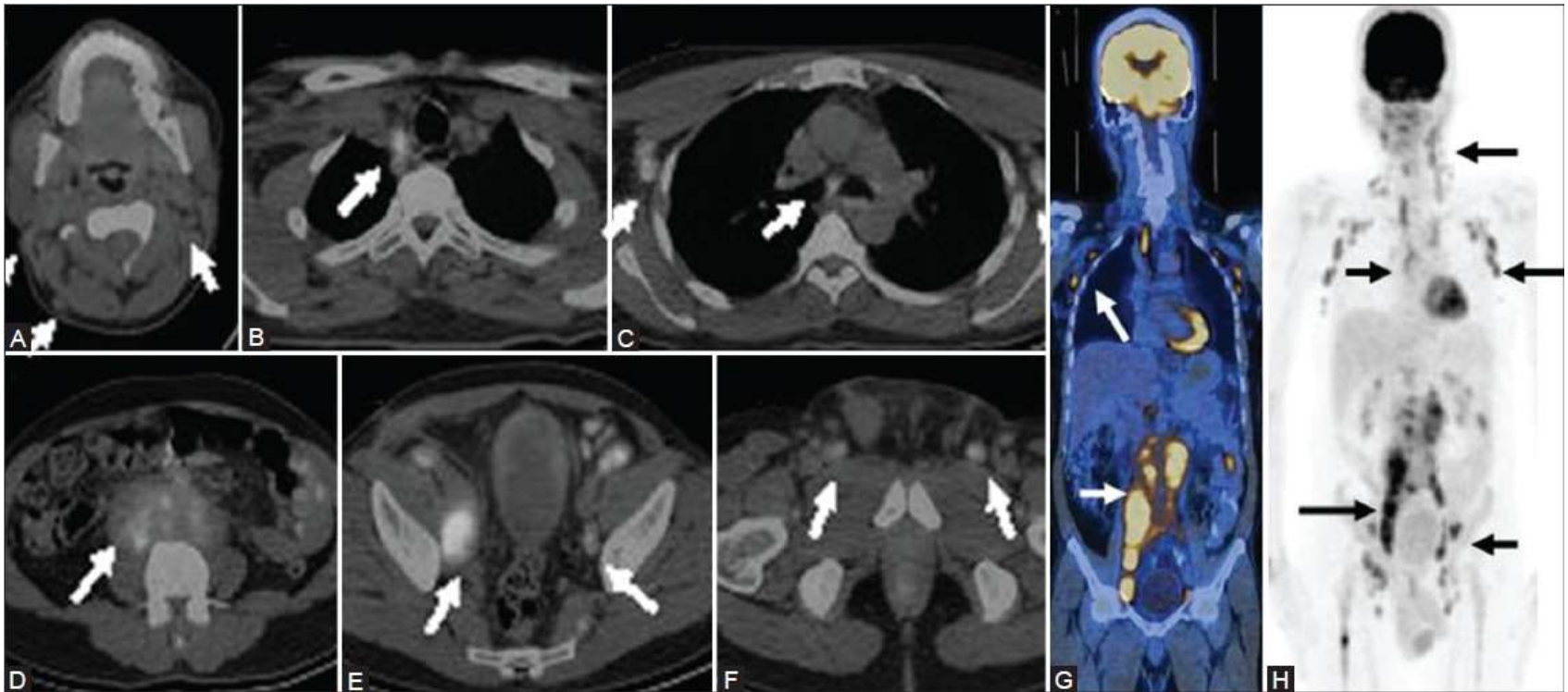
Orbital leukemic deposits in patient with acute lymphocytic leukemia (ALL)

Instrumental methods: ultrasound



Malignant lesions of the spleen: chronic lymphatic leukemia

Instrumental methods: computer tomography



Extranodal lymphoma

Laboratory methods: blood tests

- Complete blood count (CBC), including platelet and reticulocyte count
- Peripheral blood smear (examination of a sample of blood under a microscope)
- Erythrocyte (Red Blood Cells – RBC) sedimentation rate (ESR)
- Ferritin
- Serum iron
- Transferrin
- RBC folate level
- Serum vitamin B₁₂
- Hemoglobin electrophoresis
- Prothrombin time (PT), partial thromboplastin time (PTT), fibrinogen

Laboratory methods: blood tests (complete blood count)

- A complete blood count (CBC), also known as a complete blood cell count, full blood count (FBC), or full blood exam (FBE), is a blood panel that gives information about the cells in a patient's blood, such as the cell count for each cell type and usually includes:
 - Red blood cell (RBC) count
 - Hematocrit (HCT, packed cell volume, PCV)
 - Hemoglobin (Hgb)
 - Red blood cell indices
 - White blood cell types (WBC differential)
 - Platelet (thrombocyte) count
 - Mean platelet volume (MPV)

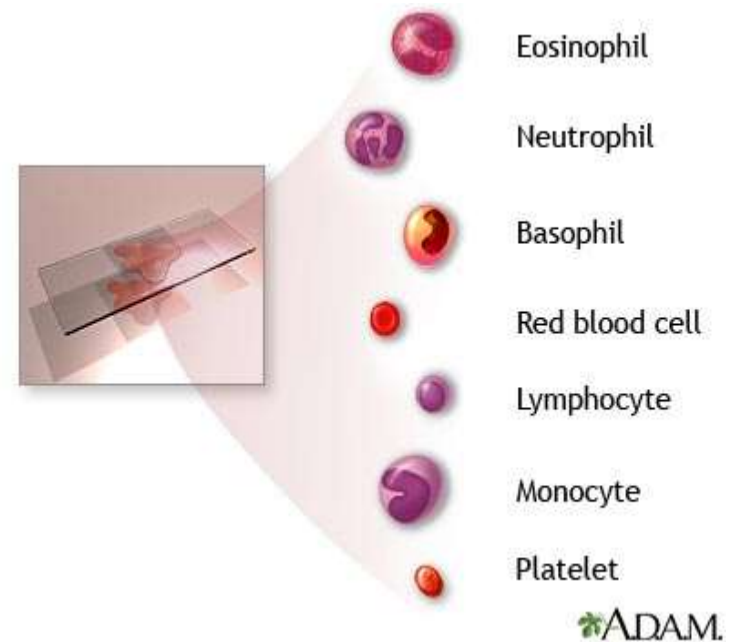
Laboratory methods: blood tests (peripheral blood smear)

- A blood smear is often used as a follow-up test to abnormal results on a complete blood count (CBC) to evaluate the different types of blood cells. It may be used to help diagnose and/or monitor numerous conditions that affect blood cell populations
- There are many diseases, disorders, and deficiencies that can affect the number and type of blood cells produced, their function, and their lifespan: anemia, myeloproliferative neoplasms, bone marrow disorders, leukemia, etc.



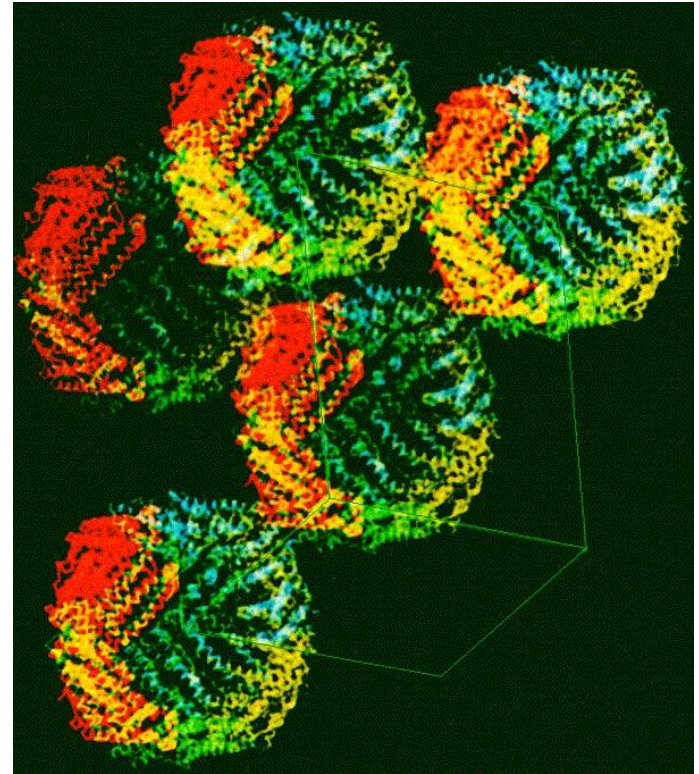
Laboratory methods: blood tests (erythrocyte sedimentation rate)

- The erythrocyte sedimentation rate (ESR) is the rate at which red blood cells sediment in a period of one hour
- The ESR is increased in inflammation, pregnancy, anemia, autoimmune disorders, infections, some kidney diseases and some cancers (such as lymphoma and multiple myeloma)
- The ESR is decreased in polycythemia, hyperviscosity, sickle cell anemia, leukemia, low plasma protein (due to liver or kidney disease) and congestive heart failure
- The basal ESR is slightly higher in females



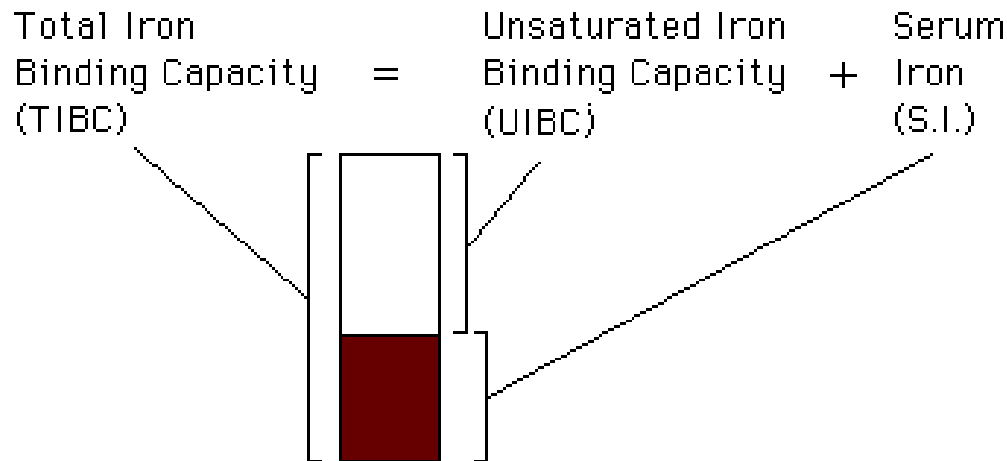
Laboratory methods: blood tests (ferritin)

- Ferritin is an ubiquitous intracellular protein that stores iron and releases it in a controlled fashion
- Serum ferritin levels are measured as part of the iron studies workup for Iron-deficiency
- A normal ferritin blood levels can vary between laboratories but are usually between 30–300 ng/mL ($=\mu\text{g/L}$) for males, and 18–115 ng/mL ($=\mu\text{g/L}$) for females



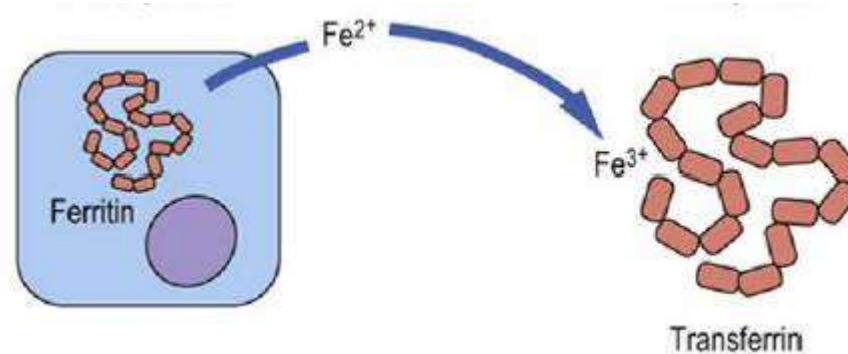
Laboratory methods: blood tests (serum iron)

Serum Iron and Iron Binding Capacity



- Serum iron is a medical laboratory test that measures the amount of circulating iron that is bound to transferrin
- Clinicians order this laboratory test when they are concerned about iron deficiency, which can cause anemia and other problems
- Normal reference ranges: in men - 65 – 176, in women - 50 - 170 ($\mu\text{g}/\text{dL}$)

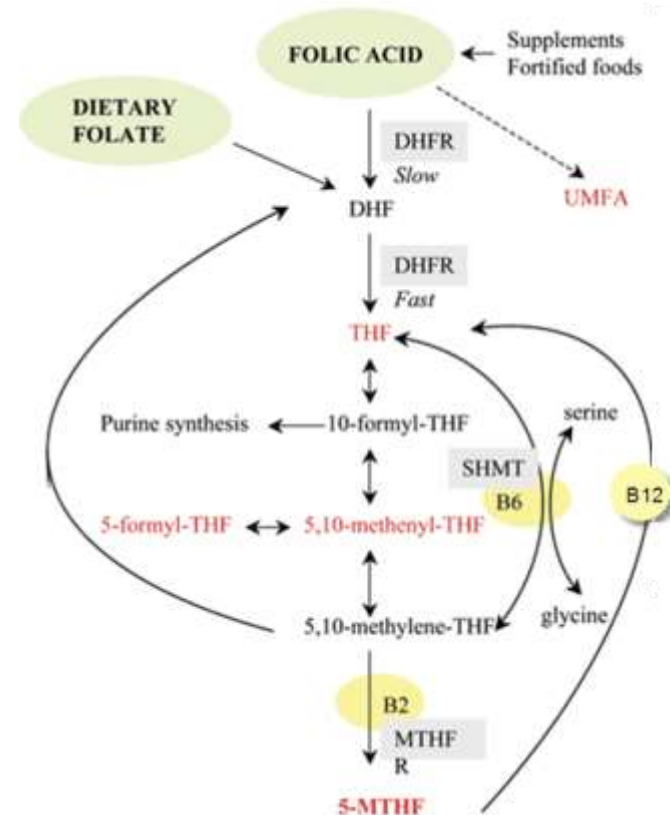
Laboratory methods: blood tests (transferrin)



- Human transferrins are iron-binding blood plasma glycoproteins, that **are** encoded by the *TF* gene and control the level of free iron in biological fluids
- An increased plasma transferrins level is often seen in patients suffering from iron deficiency anemia
- A decreased plasma transferrins level can occur in iron overload diseases and protein malnutrition
- An absence of transferrin results from a rare genetic disorder (atransferrinemia), a condition characterized by anemia and hemosiderosis
- An reference range for transferrin is 204–360 mg/dL

Laboratory methods: blood tests (folic acid)

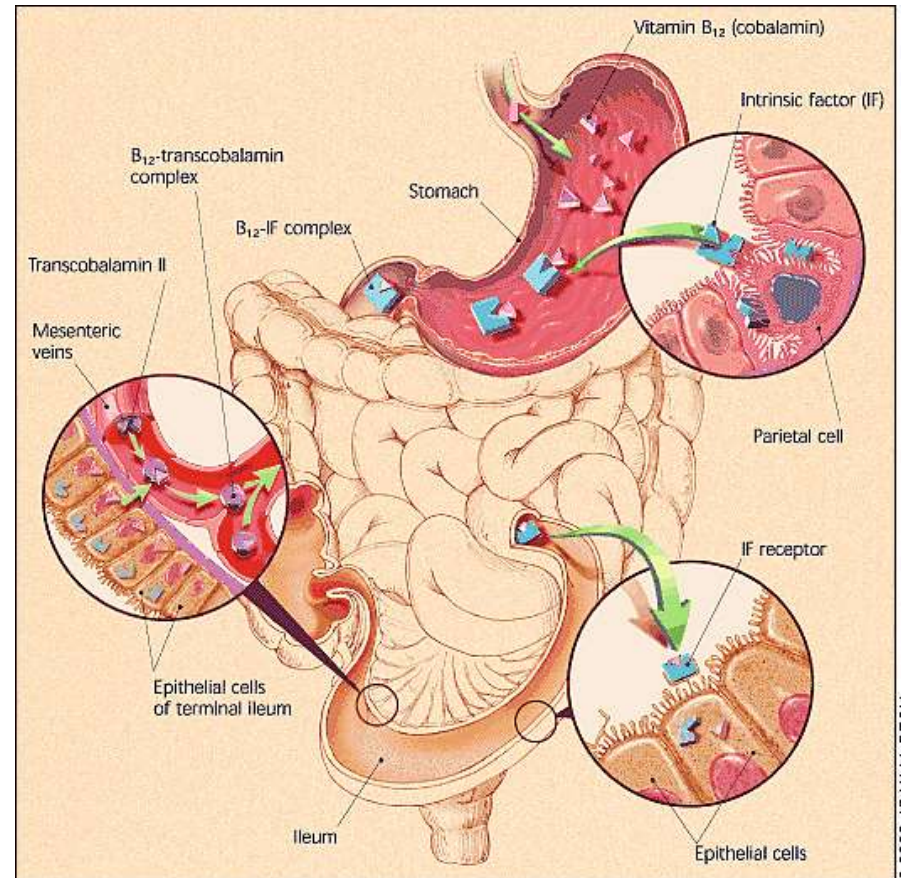
- Folic acid or folate is a B 9 vitamin
- A lack of dietary folates can lead to folate deficiency
- A complete lack of dietary folate takes months before deficiency develops as normal individuals have about 500–20,000 µg of folate in body stores
- Common symptoms of folate deficiency include diarrhea, macrocytic anemia with weakness or shortness of breath, peripheral neuropathy), psychiatric disorders (dementia, depression) etc.
- Folate deficiency during pregnancy increases the risk of neural tube defects of the fetus



Folic-acid-metabolism

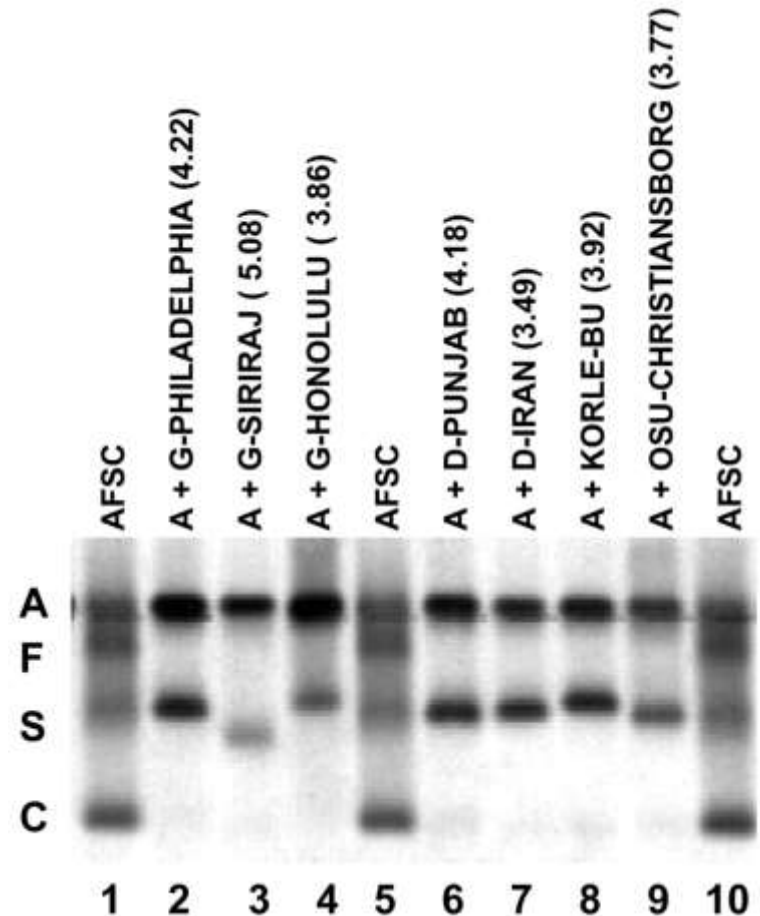
Laboratory methods: blood tests (serum vitamin B₁₂)

- Vitamin B₁₂, vitamin B12 or vitamin B-12, also called cobalamin, is a water-soluble vitamin with a key role in the normal functioning of the brain and nervous system, and for the formation of blood
- Vitamin B₁₂ was discovered from its relationship to pernicious anemia, which is an autoimmune disease
- Because intrinsic factor is crucial for the normal absorption of B₁₂, its lack in pernicious anemia causes a vitamin B₁₂ deficiency



Laboratory methods: blood tests (hemoglobin electrophoresis)

- Hemoglobin electrophoresis is a blood test that can detect different types of hemoglobin
- It uses the principles of gel electrophoresis to separate out the various types of hemoglobin and is a type of native gel electrophoresis
- The test can detect abnormal levels of hemoglobin, the form associated with sickle-cell disease, as well as other abnormal hemoglobin-related blood disorders, such as hemoglobin C
- It can also be used to determine whether there is a deficiency of any normal form of hemoglobin, as in the group of diseases known as thalassemias



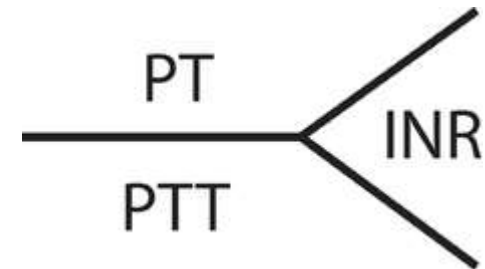
Laboratory methods: blood tests (prothrombin time)

- The prothrombin time (PT) and its derived measures of prothrombin ratio (PR) and international normalized ratio (INR) are measures of the extrinsic pathway of coagulation
- PT measures factors I (fibrinogen), II (prothrombin), V, VII, and X. It is used in conjunction with the activated partial thromboplastin time (aPTT) which measures the intrinsic pathway and common pathway
- They are used to determine the clotting tendency of blood, in the measure of warfarin dosage, liver damage, and vitamin K status



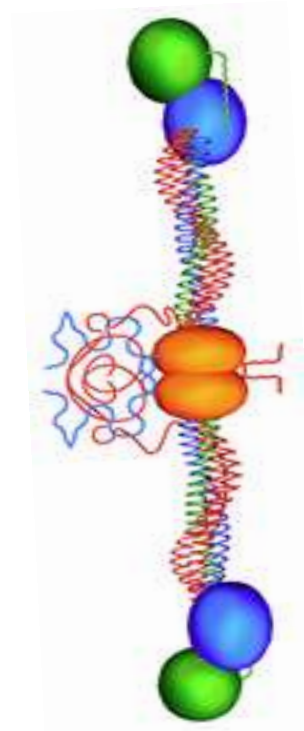
Laboratory methods: blood tests (partial thromboplastin time)

- The partial thromboplastin time (PTT) or activated partial thromboplastin time (aPTT or APTT) is a medical test that characterizes blood coagulation
- PTT is a performance indicator of the efficacy of both the "intrinsic" (now referred to as the contact activation pathway) and the common coagulation pathways
- PTT is used in conjunction with the prothrombin time (PT) which measures the extrinsic pathway
- Apart from detecting abnormalities in blood clotting, it is also used to examine coagulation factor deficiency (e.g. hemophilia)



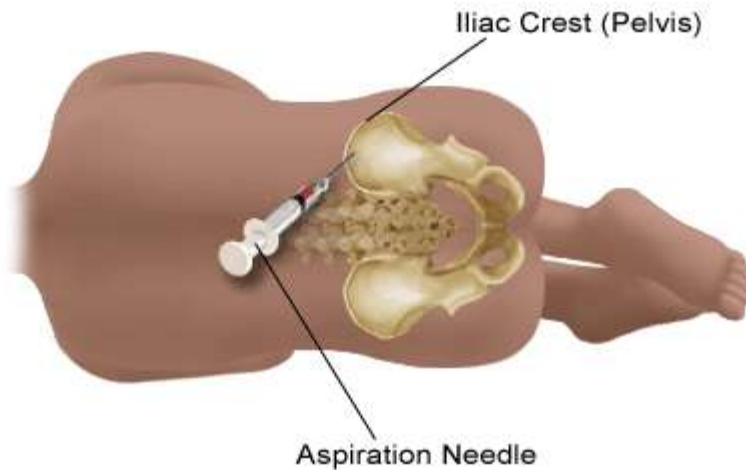
Laboratory methods: blood tests (fibrinogen)

- Fibrinogen (factor I) is a glycoprotein in vertebrates that helps in the formation of blood clots
- The fibrinogen molecule is a soluble, large, and complex glycoprotein, 340 kDa plasma glycoprotein, that is converted by thrombin into fibrin during blood clot formation
- Fibrinogen levels can be measured in venous blood
- Normal levels are about 1.5-3 g/L, depending on the method used

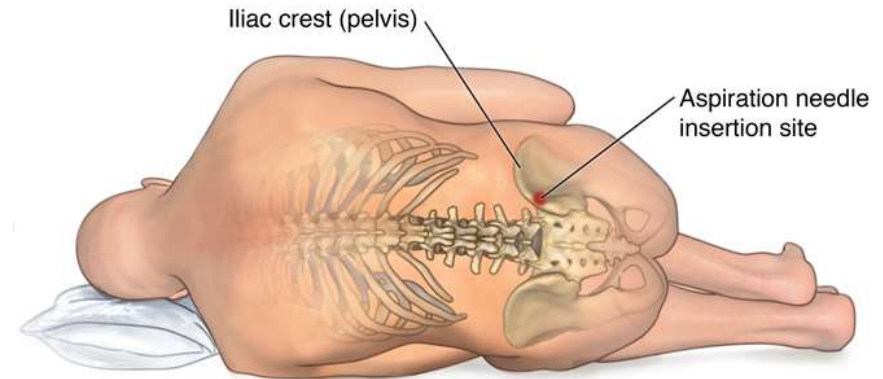


Laboratory methods: bone marrow aspiration and biopsy

Bone Marrow Aspiration



Bone marrow biopsy

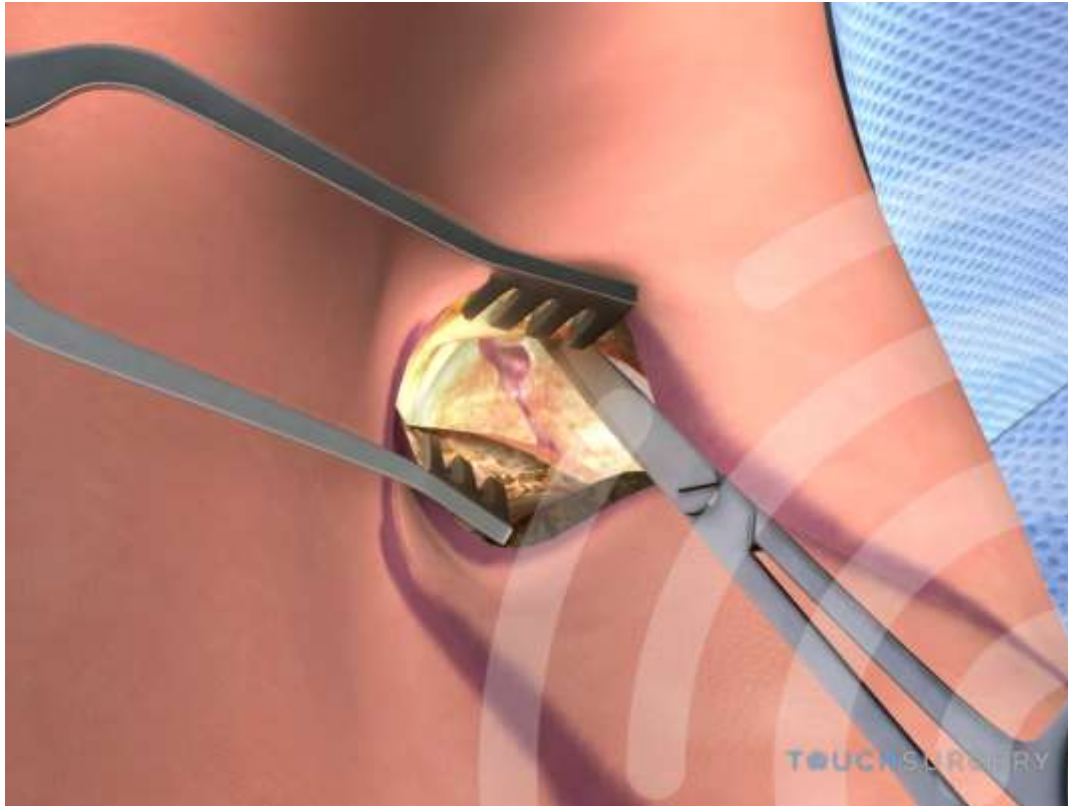


Laboratory methods: bone marrow examination

- Bone marrow examination refers to the analysis of samples of bone marrow obtained by bone marrow biopsy (a trephine biopsy) and bone marrow aspiration.
- Bone marrow examination is used in the diagnosis of a number of conditions, including leukemia, multiple myeloma, lymphoma, anemia, and pancytopenia

Comparison	Aspiration	Biopsy
Advantages	<ul style="list-style-type: none">•Fast•Gives relative quantity of different cell types•Gives material to further study, e.g. molecular genetics and flow cytometry	<ul style="list-style-type: none">•Gives cell and stroma constitution•Represents all cells•Explains cause of "dry tap" (aspiration gives no blood cells)
Drawbacks	Does not represent all cells	Slow processing

Laboratory methods: lymph node biopsy



A lymph node biopsy can be performed to diagnose certain types of leukemia in certain situations

Glossary of Patients Examination with Diseases of the Blood

Blood Glossary of Terms